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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/605,041

09/03/2003

Kevin A. McCullough

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07/01/2004

EXAMINER

SAVAGE, JASON L

BARLOW, JOSEPHS & HOLMES, LTD.

101 DYER STREET

5TH FLOOR

PROVIDENCE, RI 02903

ART UNIT

PAPER NUMBER

1775

DATE MAILED: 07/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/605,041

Applicant(s)

MCCULLOUGH, KEVIN A.

Examiner

Jason L. Savage

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 10 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 04072004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

***Information Disclosure Statement***

1. The information disclosure statement (IDS) filed 4-7-04 has been considered however it was noted that Applicant stated that the IDS was being filed as 2 parts. The Examiner only found the one part which has been initialed and is attached hereto. Should there be additional references which Applicant intended to be considered, a separate IDS should be filed.
2. Reference numbers 45 and 46, Patents 5,660,923 and 5,981,085 respectively, were not initialed since they had been cited on the PTO-892 mailed 3-25-04.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guerriero et al. (US 5,249,620).

Guerriero teaches a molding composition for a casting process for producing composite materials which comprises a metal matrix metal such as Al, Mg, Cu, a first thermally conductive filler such as metal fibers, ceramic fibers such as carbon, ceramic whiskers and/or metal powders and a second thermally conductive filler which may be a

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non-metal powder such as BN, alumina or carbon in the form of graphite or in the form of metal powders (col. 3, ln. 22-50).

Regarding the claimed volume ranges for each component, in the examples Guerriero teaches that the matrix metal is typically between 50-70% by volume (ex. 3, 6), a first thermally conductive fiber whisker may be anywhere from 10% to 20% by volume (ex. 1, 11), and that the second conductive particulate may be anywhere from 10-30% by volume (ex. 11, 12). Although Guerriero does not exemplify an embodiment wherein between 25-60 % by volume of the composition is the first, high aspect ratio, conductive filler; it does teach multiple embodiments wherein the composition contains 20% by volume of a thermally conductive whisker. Guerriero also does not teach that the first conductive fiber or whiskers can not be in amounts greater than 20% by volume. Absent a teaching of the criticality of claimed 25% by volume of the first conductive filler, it does not provide a patentable distinction over the prior art since it would have been obvious to one of ordinary skill in the art at the time the invention was made to have varied the loading of each component in order to have optimized the strength and hardness exhibited by the composite.

Regarding the claim limitation that the first thermally conductive filler have an aspect ratio of at least 10:1 and the second thermally conductive filler having an aspect ratio of less than 5:1; it is the position of the Examiner that the teaching of fibers and whiskers is a teaching of a component having an aspect ratio is greater than 10:1 and the teaching of particles or powder is a teaching of a component having an aspect ratio

of less than 5:1. Furthermore, absent a teaching of the criticality of the claimed aspect ratio ranges, they do not provide a patentable distinction over the prior art.

Regarding the limitation that the filler is evenly dispersed throughout the metallic base matrix to form a uniform composition, Guerriero teaches several methods of forming the composition which would result in a homogeneous mixture having a uniform composition including the Method of Reinforcer Agent Dispersion, Method of Dispersion of the Reinforcer Agent on a Partially Solid Matrix, Method of Powder Metallurgy (col. 2, ln. 24-48). Each of these methods recite stirring or blending the materials prior to the molding step and thus would meet the claim limitations.

Regarding the limitation that the molding composition is used in an injection molding process to form a thermally conductive article, Guerriero is silent to using an injection molding process. However, it would have been within the level of one of ordinary skill to have recognized that there would have been a reasonable expectation of success for using the molding composition of Guerriero in alternate processes such as injection molding. One of ordinary skill would have been motivated to use an alternate method such as injection molding in order to produce complex and precision-shaped parts from a variety of materials at reduced cost to conventional casting processes.

Regarding claims 2 and 12, Guerriero teaches that the matrix metal may be Al, Mg, or Cu (col. 3, ln. 34-36).

Regarding the limitations in claims 3-6, 9, 13-16 and 19, although Guerriero does not use the terms flake, rice, strand, spheroid or grain, these structures would have

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been equivalent to the whiskers and powders taught by Guerriero. Absent a showing of unexpected results, the claimed filler shapes are merely a design choice and does not patentably distinguish the present invention over the prior art of record. Furthermore, it would have been obvious to have used any shape of filler that would have been capable of producing a composite having high conductivity and low thermal expansion properties.

Regarding claims 7 and 17, Guerriero teaches that the first thermally conductive filler may be alumina fibers (col. 3, ln. 39-44).

Regarding claims 8 and 18, Guerriero teaches that the second conductive particles may be BN (col. 3, ln. 47-48).

Regarding claims 10 and 20, Guerriero teaches that the composition may contain metal powder which is the same composition as the matrix metal (col. 4, ln. 20-25). Since Guerriero has previously taught that Al, Mg and Cu are all suitable matrix metals, Al, Mg and Cu would also be suitable as the second conductive particles. Guerriero further teaches that alumina, boron nitride and carbon in the form of graphite are suitable materials for the second conductive particles (col. 3, ln. 22-50).

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guerriero et al. (US 5,249,620) in view of Ninomiya et al. (US 5,981,085).

Guerriero teaches what is set forth above and exemplifies embodiments wherein the molding composition contains 20 percent by volume of a high aspect ratio thermally conductive filler (ex. 1, 3-5, 10, and 12-14). Guerriero is silent to the first thermally

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conductive filler being present between 25-60 volume percent however it does not teach that volume percentages of fibers must be limited to 20 percent.

Ninomiya teaches a highly thermally conductive molding composition comprising a matrix metal and a preform made of a conductive material (col. 11, ln. 63-67).

Ninomiya teaches that the conductive material may include a high aspect ratio first thermally conductive fiber and a second low aspect ratio second thermally conductive particle (col. 16, ln. 25-45). Ninomiya further teaches that the first thermally conductive high aspect ratio fiber may be present in amounts between 40 to 60% by volume (col. 19, ln. 10-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the method of Guerriero with a reasonable expectation of success of producing reinforced conductive articles having high mechanical properties by following the teaching of Ninomiya by adding volume percentages of a high aspect ratio fiber of up to 60 volume percent in the molding composition.

### ***Response to Arguments***

6. Applicant's arguments filed 6-10-04 have been fully considered but they are not persuasive.

Applicant argues that Guerriero teaches a two-step process where the filler materials are first formed into a distinct structure prior to the infiltration step which is in direct contrast to the claimed method which is drawn to a uniform composition wherein the matrix metal and filler materials are missed into a homogenous distribution before

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the molding process. While the embodiment cited by Applicant in col. 3, ln. 55-60 of Guerriero is indeed drawn to a method which forms a preform prior to infiltration, the reference must be considered as a whole. Guerriero teaches several methods of forming the composite material and more specifically teaches three separate methods which read on the claimed invention. Method of Reinforcer Agent Dispersion, Method of Dispersion of the Reinforcer Agent on a Partially Solid Matrix and Method of Powder Metallurgy all teach methods wherein the filler is not formed into a distinct structure, instead the loose filler materials are dispersed and stirred (emphasis added) with the matrix material or the filler material is blended (emphasis added) with the matrix material powders (col. 2, ln. 25-52). The fact that one particular embodiment in a reference may not meet the claim limitations does not overcome the fact that multiple other embodiments meet the claim limitations.

Applicant further argues that the thrust of Ninomiya is directed to increasing the strength to resist surface peeling and as such the filler concentrations must be concentrated at the surface of the part as shown in layer 2. First, Ninomiya was merely relied upon as a teaching that it is known and as such obvious to include higher percentage of high aspect ratio material than was exemplified in the embodiments of Guerriero. Thus, whether the fillers must be concentrated at the surface or not is moot to the present rejection. It is well settled that the test of obviousness is not whether the features of one reference can be bodily incorporated into the structure of another and proper inquiry should not be limited to the specific structure shown by the references, but should be into the concepts fairly contained therein, and the overriding question to



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be determined is whether those concepts would suggest to one of ordinary skill in the art the modifications called for by the claims, *In re Van Beckum*, 169 USPQ 47 (CCPA 1971), *In re Bozek*, 163 USPQ 545 (CCPA 1969); *In re Richman*, 165 USPQ 509 (CCPA 1970); *In re Henley*, 112 USPQ 56 (CCPA 1956); *In re Sneed*, 218 USPQ 385 (Fed. Cir. 1983).

In response to the issue whether the reference is nonanalogous art, it has been held that the determination that a reference is from a nonanalogous art is twofold. First, one decides if the reference is within the field of the inventor's endeavor. If it is not, one proceeds to determine whether the reference is reasonably pertinent to the particular problem with which the inventor was involved, *In re Wood*, 202 USPQ 171, 174. In the instant case, both Guerriero and Ninomiya are drawn to methods of producing thermally conductive articles comprising a matrix containing multiple filler materials.

Applicant states that in contrast, it would be obvious to one skilled in the art that the disclosure of the present invention in fact weakens the overall structure and detracts from highly stable part geometries due to the dissimilarities in the adjacent materials throughout the base matrix material. It is unclear how arguing that the structure formed by the method of the present invention is inferior to that of the prior art would relate to present rejections.

Applicant further argues that with respect to claims 15, 19, and 20, Ninomiya does not teach a variety of things including that at least one filler is a ceramic. The argument that one filler is a ceramic is not commensurate in scope with the cited claims. Furthermore, as was stated above, Ninomiya is merely being relied upon as a teaching

that higher percentages of high aspect ratio material is known and thus an obvious modification. As such, Applicant's arguments based on the supposed lack of teachings of certain materials, shapes or dispersions is moot.

In addition, despite Applicant's assertions to the contrary, it was noted that Ninomiya clearly teaches the use of two thermally conductive fillers, including ceramic materials, which have different shapes and/or aspect ratios (Table 7).

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry to this communication or earlier communications from the Examiner should be directed to Jason Savage, whose telephone number is (571)272-1542. The Examiner can normally be reached Monday to Friday from 6:30 AM to 4:00 PM.


If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Deborah Jones, can be reached on (571)272-1535.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jason Savage

6-23-04



**JOHN J. ZIMMERMAN**  
**PRIMARY EXAMINER**